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Physiology

Comparative Usefulness of C-reactive Protein and Erythrocyte Sedimentation Rate in Patients with Rheumatoid Arthritis

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Abstract **Original Research Article**

***Background*:** Laboratory tests such as the erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) have been utilized as indicators of inflammation and disease activity in rheumatoid arthritis (RA), but there is still no clear consensus on when to employ one, the other, or both. ***Aim of the Study*:** The study aims to analyze the association between ESR and CRP levels in active RA patients and disease activity indicators. ***Methods*:** This study was conducted at the Orthopaedics OPD at TMSS medical college hospital & Ibne Sina Diagnostic Centre Bogura, Bangladesh, from January 2023 to December 2023. In the study, 120 patients with active RA were involved. All of the data was gathered, recorded into a Microsoft Excel work sheet, and then descriptive statistics were used in SPSS 23.0 for analysis. ***Results*:** the study included 120 RA patients, with 88 females and 32 males. The participants' ages ranged from 25 to 69 years (Mean±SD = 47.7±11.3). During the trial, all patients had disease activity, with DAS28 scores ranging from 2.9 to 7.5 (Mean ± SD = 5.42 ± 1.1). ESR readings ranged from 10 to 150mm/h in the first hour (Mean±SD = 52.9±33.9). CRP was positive in 81 patients but negative in 39 (67.5% vs. 32.5%). CRP levels ranged from 0.6 to 65 mg/dL (Mean±SD = 18.1±15.8). Male and female patients revealed significant differences in DAS28 (P=0.031). The study found a significant correlation between DAS28 values, tender and swollen joints, and ESR values (P values < 0.001, < 0.001, 0.004, respectively). However, there was no significant correlation between DAS28 patients' age and CRP values (P values 0.60, 0.18, respectively). ***Conclusion*:** Our study reveals that CRP is not a reliable indicator of inflammatory activity in RA patients in clinical settings. The use of CRP as a marker of inflammation in everyday practice should be reconsidered.

Keywords: Erythrocyte sedimentation rate, C-reactive protein, Rheumatoid arthritis, Disease activity score.

INTRODUCTION

Rheumatoid arthritis (RA) is a chronic condition that causes inflammation of many joints. This condition can cause extra-articular symptoms such as rheumatoid nodules, vasculitis, heart or lung illness, anemia, and peripheral neuropathy. RA is classified as an autoimmune illness, yet the exact cause remains uncertain. Currently, no single test can accurately assess disease activity in RA due to the diverse range of symptoms and indicators [1]. Various measurements are used to assess disease activity in rheumatoid arthritis (RA). For years, clinicians have relied on laboratory tests like erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) to detect inflammation. However, there is no clear consensus on when to employ one or both [2]. CRP is now the most often used serological measure to assess acute disease activity [3]. The disease activity score (DAS) and its variations incorporate ESR or CRP, leading to greater use and discussion over their significance in disease activity evaluation. ESR and CRP may have a disproportionate impact on overall scores due to their calculation method [4]. Monitoring RA patients can be challenging due to up to 40% having normal ESR or CRP at presentation [5]. This makes it difficult to use these measurements in nearly half of active, treatment-requiring RA patients. Numerous research have compared the quantitative utility of ESR and CRP, but no clear consensus has emerged. The American College

of Rheumatology (ACR) core data collection includes ESR and/or CRP, which have been employed in treatment studies as the primary laboratory marker for disease activity in RA [2]. This study examined the connection between ESR and CRP levels in active RA patients and disease activity indicators.

METHODOLOGY

This study was conducted at the Orthopaedics OPD at TMSS medical college hospital & Ibne Sina Diagnostic Centre Bogura, Bangladesh, from January 2023 to December 2023. The study included 120 patients with active RA who were diagnosed using the American College of Rheumatology (ACR) and European League Against Rheumatism (EULAR) updated criteria [6]. The patients underwent a complete general and articular examination. Tender and swollen joint counts were calculated. Laboratory investigations included measuring ESR using the Westergren method [7] and CRP using the ELISA method [8], as well as assessing disease activity using the DAS28 score [9]. All of the data was gathered, recorded into a Microsoft Excel work sheet, and then descriptive statistics were used in SPSS 23.0 for analysis. Categorical data were presented as numbers and percentages, whilst continuous data were given as mean, standard deviation, and range. Tests of significance included Spearman's correlation coefficient (rho) and the Man Whitney U test. The accepted threshold of significance in this study was 0.05 ($P \leq 0.05$ was considered significant).

RESULT

Table-1 shows that the study included 120 RA patients, with 88 females and 32 males. The participants' ages ranged from 25 to 69 years (Mean±SD = 47.7±11.3). During the trial, all patients had disease activity, with DAS28 scores ranging from 2.9 to 7.5 (Mean ± SD = 5.42 ± 1.1). ESR readings ranged from 10 to 150mm/h in the first hour (Mean±SD = 52.9±33.9). CRP was positive in 81 patients but negative in 39 (67.5% vs. 32.5%). CRP levels ranged from 0.6 to 65 mg/dL (Mean±SD = 18.1±15.8). Male and female patients revealed significant differences in DAS28 (P=0.031) (Table-2). The study found a significant correlation between DAS28 values, tender and swollen joints, and ESR values (P values < 0.001, < 0.001, 0.004, respectively). However, there was no significant link between DAS28 patients' ages and CRP levels (P values 0.60 and 0.18, respectively) (Table-3).

Table-1: Basic characteristics of the patients

Variable		Number (N=120)	Percentage (100)
Gender	Male	32	26.67
	Female	88	73.33
	Mean±SD	**Min.**	**Max.**
Age	47.7±11.3	25	9
TJC	13.8±9.6	0	28
SJC	2.15±4.9	0	22
DAS	5.42±1.1	2.9	7.5
ESR	52.9±33.9	10	150
	18.1±15.8	0.6	65
CRP	Positive	81	67.5
	Negative	39	32.5

Table -2: Comparing DAS between sex

Parameter	Sex	Number	Mean±SD	"Z" of MWU	P-value
DAS	Male	32	6.32±1.22	2.15	0.031*
	Female	88	5.32±1.05		

Table-3: Correlation between DAS and the studied variables

	DAS	
	rho	**P-value**
Age	-0.06	0.60 NS
TJC	0.84	<0.001** HS
SJC	0.55	<0.001** HS
ESR	0.32	0.004*S
CRP	0.15	0.18 NS

DISCUSSION

ESR and CRP were initially used to evaluate treatment efficacy in inflammatory illnesses like RA [10]. This study examined the ESR and CRP levels of

active RA patients at the Orthopaedics OPD at TMSS medical college hospital & Ibne Sina Diagnostic Centre Bogura, Bangladesh, and their link with disease activity indicators. The study included 120 RA patients, with 88 females and 32 males. Patients had a mean DAS of 5.24 ± 1.1, ESR of 18.1 ± 15.8, and CRP of 52.9 ± 33.9.

ESR linked with DAS in RA patients, although CRP did not (P= 0.004 and 0.18, respectively). However, there was no significant association between ESR and CRP among the RA patients. According to a 2010 study, ESR and CRP cannot be used to diagnose RA due to the possibility of 45% of patients having normal serum levels at presentation, despite being part of the diagnostic criteria [11]. A 25-year longitudinal study in Finland and the USA found that the majority of patients with rheumatoid arthritis (RA) had abnormal erythrocyte sedimentation rate, CRP, or RF levels. More than 37% of patients had an ESR < 28 mm/h, normal CRP, or negative RF results. The similarity of laboratory test data from two sites on separate continents with varying disease durations suggests that the findings can be generalized. At this stage, many RA patients have normal ESR, CRP, and RF levels [12]. JEFFREY *et al.*, (2012) found a link between MBDA (multi-biomarker disease activity) and DAS28-CRP in RA patients across multiple clinical centers, regardless of autoantibody status, disease activity, or RA therapy [13]. The current investigation found no significant link between CRP and disease activity, contradicting a prior study that found blood CRP to be the most effective biochemical measure for assessing disease activity in RA patients [1]. According to several investigators, ESR and CRP levels have a limited correlation with disease activity indicators. Further investigation into the role of ESR and CRP as inflammatory markers in RA patients in normal care may be necessary [2]. Some patients with active RA may have normal erythrocyte sedimentation rate (ESR) and/or C-reactive protein (CRP) levels, despite having elevated individual components of the Clinical Disease Activity Index (CDAI) such as tender and swollen joint counts and patient and physician global assessment [14]. When using this test generically, it's important to consider that certain RA patients may have low CRP levels due to genetic variations associated with low CRP levels [11]. Elevated fibrinogen levels in the blood can cause ESR to rise, even in non-inflammatory situations. These conditions include pregnancy, diabetes, end-stage renal disease, and heart disease. Increased concentrations of a single molecular species, as monoclonal immunoglobulin in multiple myeloma, can lead to sedimentation [10]. Microcytosis, polycythemia, and abnormally shaped RBCs (such as sickle cells and spherocytes) diminish aggregation and lower ESR [15]. In obesity, both ESR and CRP are raised, likely due to IL-6 release by adipose tissues [16].

Limitation of the Study:

This study had a single focal point and small sample sizes. Therefore, it's possible that the study's findings don't accurately capture the overall situation.

CONCLUSION & RECOMMENDATION

In conclusion, we propose that CRP is not a reliable marker for monitoring inflammatory activity in RA patients in clinical settings. The function and reliance on CRP as a marker of inflammation in everyday practice should be reconsidered.

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